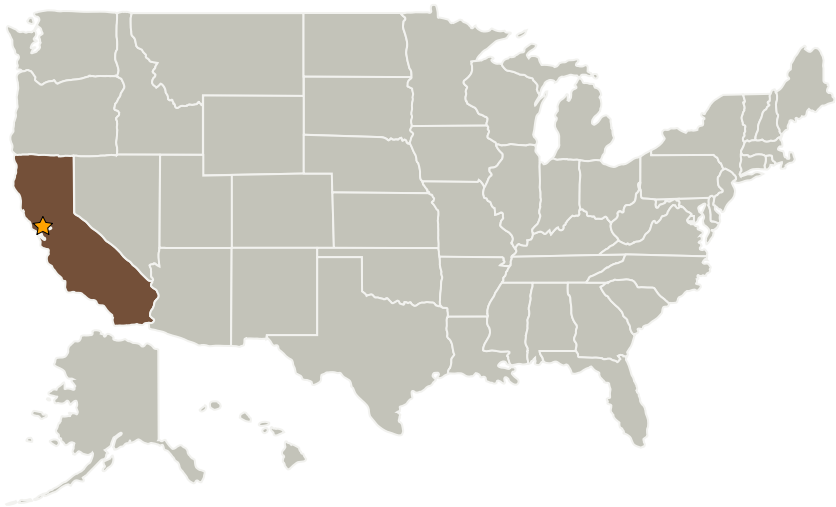
Lab on a Chip LCVR Polarimeter for Exploration of Life Signatures, Phase I

Completed Technology Project (2009 - 2009)

Project Introduction

Life on Earth is unique in many ways; one of its great mysteries is that all the biomolecules of Earth's life are chiral and one optical isomer of each amino acid or nucleic acid "building block" was selected by evolution. In our pursuit of finding life on Mars and beyond, it is likely that one of the clues to extant or extinct life could be the detection of non-racemic chiral molecules. This proposal describes the development of a highly miniaturized and ultrasensitive lab-on-a-chip polarimeter to measure the optical rotation of biomolecules such as amino acids, sugars, DNA, RNA in samples extracted from other planets or moons. The proposed polarimeter will be based on liquid crystal variable retarder (LCVR) technology. This technology offers a highly sensitive optical rotation measurement, from extremely small sample volumes, in a highly miniaturized format. This work is a joint collaboration between Intelligent Optical Systems, Professor Axel Scherer of the California Institute of Technology, and Meadowlark Optics. In Phase I, we propose to fabricate an LCVR polarimeter and demonstrate its ability to measure small angles of optical rotation. High sensitivity, low-power consumption, no moving parts, and potential for integration into future exploration missions are the attractive attributes of the proposed technology. In Phase II, we will optimize the performance, develop prototypes, and conduct extensive testing.

Primary U.S. Work Locations and Key Partners



Lab on a Chip LCVR Polarimeter for Exploration of Life Signatures, Phase I

Table of Contents

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Ames Research Center (ARC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Small Business Innovation Research/Small Business Tech Transfer

Lab on a Chip LCVR Polarimeter for Exploration of Life Signatures, Phase I

Completed Technology Project (2009 - 2009)

Organizations Performing Work	Role	Type	Location
★Ames Research Center(ARC)	Lead Organization	NASA Center	Moffett Field, California
Intelligent Optical Systems, Inc.	Supporting Organization	Industry	Torrance, California

Primary U.S. Work Locations
California

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Technology Areas

Primary:

- TX03 Aerospace Power and Energy Storage
  - TX03.3 Power Management and Distribution
    - TX03.3.4 Advanced Electronic Parts